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Description of a new large-bodied species of *Apomys* Mearns, 1905 (Mammalia: Rodentia: Muridae) from Mindoro Island, Philippines

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Abstract.—*Apomys gracilirostris,* a new species in the Philippine endemic murid genus *Apomys,* is described from the Mount Halcon highlands on Mindoro Island. The new species is compared with its larger-bodied congeners: *A. abrae, A. datae, A. sacobianus,* and the two nominal subspecies of *A. insignis, A. i. insignis* and *A. i. bardus.* Twenty-eight cranial, mandibular, and dental measurements were taken on the 83 specimens representing these taxa and the new species. All species examined formed discrete groups in a principal component analysis; there were no apparent differences between the two nominal subspecies of *A. insignis.* The new species differs from congeners in its combination of large body, very long tail, dark pelage, gracile cranium with a long rostrum, and highly compressed upper incisors; the most diagnostic features of the species are the extremely fine upper and lower incisors (with no enamel on the lower), and the degree of molar reduction and simplification.

In 1905, Edgar A. Mearns proposed the generic appellation *Apomys* for representatives of a new species of rodent he had collected on Mount Apo, in southern Mindanao Island, Philippines (Mearns 1905). Different investigators historically have shown considerable flux with respect to the taxonomic placement of the genus (review by Musser 1982). However, since the exhaustive review and diagnosis of *Apomys* by Musser (1982), there has been no doubt as to the validity of these organisms constituting a genus level category. As currently defined (Musser 1982, Musser & Heaney 1992), *Apomys* is restricted to the Philippine Archipelago (excluding the Sunda Shelf island of Palawan and associated peripheral islands).

Eight species are now included in the genus: *A. hylocoetes* and *A. insignis* from Mindanao Island, *A. littoralis* from Mindanao, Leyte, Biliran, and Bohol Islands (Heaney et al. 1989, Musser & Heaney 1992, Rickart et al. 1993), *A. microdon* from southern Luzon and Catanduanes Islands, *A. musculus* from Luzon and Mindoro Islands, and *A. datae* and *A. abrae* from Luzon Island. An additional species, currently undescribed, recently has been reported from a number of islands in the central Visayas group of the Philippine Archipelago (Musser 1982, Musser & Heaney 1992; L. R. Heaney, pers. comm.).

During a biodiversity inventory survey carried out in 1992 on some components of the major Pleistocene island masses (sensu Heaney 1986), one of the localities that was visited was the Mount Halcon massiff, in the northern part of the island of Mindoro. Mount Halcon, reported to reach ca. 2500 m in elevation, had been explored by Edgar A. Mearns in 1906 (Merrill 1907a); however, only 17 of the 496 mammals brought back by him were from Mindoro. Most of his collection from the Mt. Halcon area consisted of *Crocidura*; all told, eight nominal taxa in four orders were collected by him, including the holotypes of five nominal taxa. The object of the current exploration of the Mount Halcon area was to increase sample sizes of some of these taxa in order to arrive at a better assessment of geographic and nongeographic variation, as well as to determine whether additional species, which Mearns may have missed, also existed in the area.

One mammal species found between 1255 m and 1900 m elevation on the north slope of Mount Halcon was a medium-sized rodent, similar to *Apomys* in having a slender rostrum, as opposed to the short, high, blunt rostrum of *Rattus*. The lower incisors were more procumbent than those of *Rattus*, and lacked pigment. The general gestalt, mostly related to how gracile this rodent was, therefore pointed, barring the relatively large size, to its pertenence in the genus *Apomys*. Subsequent examination of cranial morphology, and conversations with colleagues, confirmed this suspicion. Accordingly, individuals collected in that taxon are described below as a new species of *Apomys* from the northern highlands of Mindoro.

Methods

Except for specimens of the new species (at the Cincinnati Museum of Natural History), and those of *Apomys sacobianus* (National Museum of Natural History, USNM), all specimens examined are from the Field Museum of Natural History (FMNH). Terminology referent to molar cusps follows Miller (1912) for upper molars, and Musser and Heaney (1992) for lower molars. Cranial and mandibular measurements were taken with a digital caliper to the nearest 0.01 mm. Twenty-eight cranial, mandibular, and dental measurements, listed below, were taken; the 23 cranial measurements were described and illustrated in Musser (1979); mandibular measurements are defined below. Measurements (abbreviations in parentheses) included: breadth of braincase (BB), breadth across incisive foramina (BIF), breadth across incisor tips (BIT), breadth of palatal bridge at first, and at third molars (BM1, BM3), breadth of mesopterygoid fossa (BMF), breadth of rostrum (BR), breadth of zygomatic plate (BZP), height, and length, of auditory bulla (HB, LB), height of braincase (HBC), interorbital breadth (IB), incisive foramina to M1 (IFM1; modified to be straightline shortest distance, rather than anteroposterior distance), length of diastema (LD), length of incisive foramina (LIF), alveolar length of maxillary toothrow (LMT), length of nasals (LN), length of palatal bridge (LPB), length of rostrum (LR), occipitonasal length (ONL), palatal length (PL), postpalatal length (PPL), and zygomatic breadth (ZB). Five additional measurements not used by Musser (1979) were taken: length of dentary (LMAND), the greatest length of dentary from upper incisive alveolar rim to mandibular condyle; length of mandibular toothrow (LMT), alveolar length of mandibular toothrow; height of mandible (HMC), greatest height of mandible; height of mandibular ramus (HMR), lowest height of ramus in mandibular incisive diastema; and thickness of mandible (TM), measured at thickest point below m2.

Statistical analyses were performed on an 80486 equipped 33 MHz microcomputer using the Statistical Analysis System software, version 6.03 (SAS Institute 1988a, 1988b), generally following Ruedas & Bickham (1992). Univariate statistics, including mean, standard error, moment statistics (skewness, g_1; and kurtosis, g_2) and tests of normality were performed invoking the "normal" option of the UNIVARIATE procedure, which tests for normality using the Shapiro-Wilk statistic, W, and provides the associated probability value. A principal component analysis was carried out to determine whether any group separation occurred using the measurements taken. Such a posteriori grouping methods are preferred herein over a priori grouping methods (mul-

Table 1.—Values for the first through third eigenvectors from the principal component analysis carried out on the correlation matrix of the cranial and mandibular morphometric data of specimens of *Apomys*. Refer to text for character abbreviations. The first four principal components together account for 91.5% of the variation (68.5%, 13.3%, 5.5%, and 2.2%, respectively). Results of the principal component analysis are graphically summarized in Fig. 1.

	Component		
	1	2	3
BB	0.2092	−0.2372	−0.0489
BIF	0.1498	0.3402	0.0601
BIT	0.1244	0.2985	0.4763
BM1	0.1684	−0.0566	−0.5707
BM3	0.1942	−0.2232	−0.1403
BMF	0.0993	0.3870	−0.0400
BR	0.2279	−0.0040	0.2225
BZP	0.2509	0.1233	0.0151
HB	0.1408	0.3926	0.0275
HBC	0.2454	−0.0082	−0.0001
IB	0.0362	−0.1522	0.3550
IFM1	0.1443	−0.3582	0.0222
LB	0.2012	0.0836	−0.2576
LD	0.2465	−0.1715	−0.0298
LIF	0.2353	0.1279	−0.2145
LM13	0.2081	0.2802	−0.1150
LN	0.2610	−0.0246	0.0379
LPB	0.2370	−0.1172	0.1331
LR	0.2453	−0.1326	0.1170
ONL	0.2653	−0.0583	0.0164
PL	0.2651	0.0501	−0.0369
PPL	0.2576	−0.0188	0.0451
ZB	0.1841	−0.2135	0.2830

tiple range tests, canonical discriminant analysis) because there is no prior hypothesis as to the putative identity of the specimens being examined.

Specimens Examined

A. abrae: Philippines: Luzon Island, Ilocos Norte Prov.; Mount Simminublan, 4300–4350 ft. FMNH nos. 92752–92755, males; 92756–92762, females. Abra Prov.; Massisiat, 3500 ft. FMNH 62749, female. Mountain Prov.; Mt. Data, 5300-8000 ft. FMNH 62700, 62724, 62726, 62728, 62738–62740, males; 62719–62723, females.

A. datae: Philippines: Luzon Island, Mountain Prov.; Mount Data, 5300–8000 ft. FMNH 62695, 62696, 62699, 62720, 62741, males; 62706, 62709, 62711, 62712, 62725, 62727, 62731, 62733–62735, 62742, 62744, females. Mountain Prov.; no specific locality. FMNH 62761, female.

A. insignis bardus: Philippines: Mindanao Isl., Zamboanga del Norte Prov.; Grand Malindang Mountains, Dapitan Peak, 6700–7450 ft. FMNH 87568 (young), 87571–87573, males, 87567, 87569, 87570, females.

A. i. insignis: Philippines: Mindanao Isl., Bukidnon Prov.; Malaybalay, Mount Kitanglad, 4200–5000 ft. FMNH 92806, 92808–92812, 92815, 92816, 92818, 92819, 92821, males; 92807, 92813, 92814, 92817, 92820, 92822, females. Davao Prov.; East slope of Mount McKinley, 3500–7100 ft. FMNH 56267, 56270, 56276–56278, males; 56266, 56268, 56269, 56272–56275, 56282, 56285, 56288, females.

A. sacobianus: Philippines: Luzon Isl., Pampanga Prov.; Angeles, Clark Air Base, Sacobia River. USNM 304352, 557717.

Apomys n. sp.: see below, holotype and paratypes.

Results

Descriptive statistics for species of *Apomys* examined in this study are listed in Appendix 1. Results of the principal component analysis (Fig. 1) show considerable, non-overlapping variation among different nominal taxa within *Apomys*. The first four principal components account for 91.5% of the variation (Table 1). Principal component 1 accounts for 68% of the variation and separates *A. insignis* from remaining *Apomys*. Variation is spread fairly evenly over all characters in principal component 1, but characters with heavy loadings include occipitonasal length, palatal length, length of nasals, and postpalatal length. Since *A. insignis* is smaller in all measurements than the *Apomys* considered herein, principal component 1 appears to be constituted

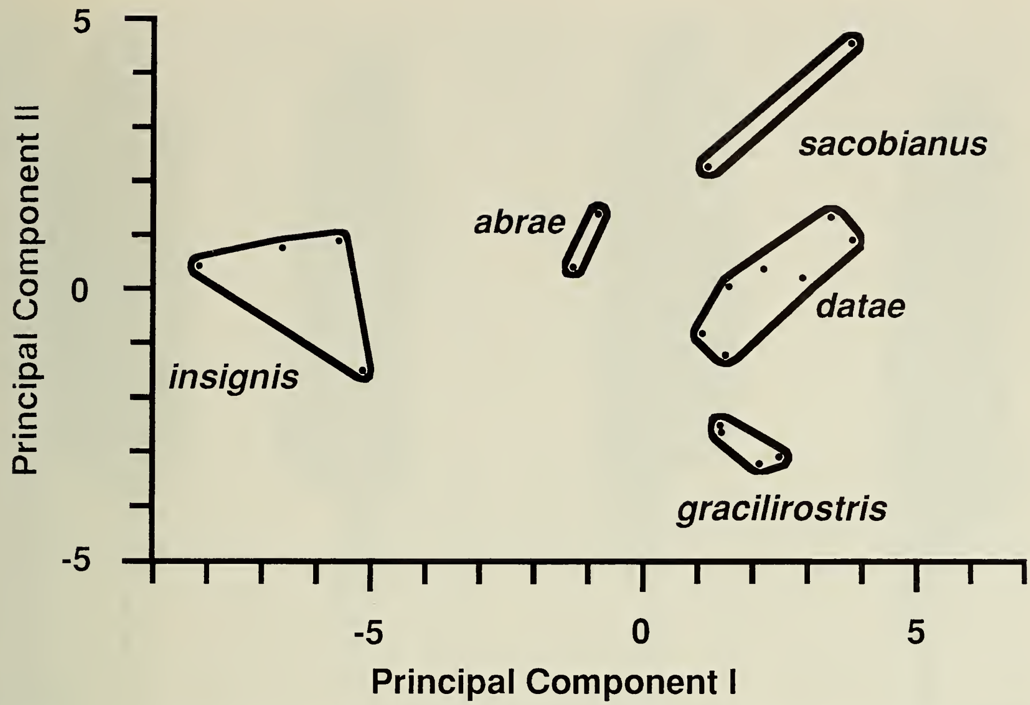

Fig. 1. Plot of principal component scores (PC 1 vs. PC 2) for six species of *Apomys* examined in this study.

primarily on the basis of size. Principal component 2 accounts for 13% of the variation and separates the Mount Halcon taxon from remaining *Apomys*. This principal component shows heavy loadings on height of bulla, breadth of mesopterygoid fossa, straightline distance between incisive foramen and M1, breadth of incisive foramina, breadth of incisor tips, and length of maxillary toothrow. These are measurements in which the Mount Halcon taxon is quite distinct (either larger or smaller) from remaining *Apomys* examined herein; as a consequence, it also appears to be constituted on the basis of magnitude of linear measurements.

Inspection of descriptive statistics (Appendix), of results of principal component analysis, (Table 1 and Fig. 1), and of several discrete characters, clearly identifies the specimens of *Apomys* from the Mindoro highlands as a new species. The species is described below, being named

Apomys gracilirostris, new species
Figs. 2–5

Holotype.—National Museum of the Philippines (NMP) No. 3482 (fide Pedro C. Gonzales; also Cincinnati Museum of Natural History [CMNH] No. 650, and field collection number NMP/CMNH 1136), an adult male snared by Pedro Bangol, a Mangyan native from Lantuyan (= Dulangan Dos); the specimen will be permanently housed at the National Museum of the Philippines. The provenance is: Philippines: Mindoro Island; Mindoro Occidental Province; Municipality of San Teodoro, North Ridge approach to Mount Halcon, ca. 1580 m; ca. 13°16′48″N, 121°59′19″E; this area is known to the Mangyan tribespeople as "Hangló." Date of collection is 12 June 1992. Specimen preserved as a dried skin and skull, in good condition.

Paratypes and localities.—Besides the holotype, an additional 15 specimens are

Fig. 2. Dorsal and ventral views of *Apomys gracilirostris* CMNH 646 (left in each pair) and 649 (right). Specimen 646 is homogeneously colored dorsally and ventrally, while 649 is paler (buffy) in ventral coloration. Length of head and body and tail length (in millimeters) are 147 and 175 (CMNH 646) and 146 and 179 (CMNH 649).

known. Four, snared by Pedro Bangol at the same locality as the holotype, but at elevations ranging between 1675 an 1731 m, are prepared as dried skins with a full skeleton extracted from the left side, body skeleton from the right: CMNH 646 (NMP/CMNH 1119), an adult female (right zygomatic arch broken), 7 Jun 1992; CMNH 647 (NMP/CMNH 1126), young adult male snared 9 Jun 1992; CMNH 648 (NMP 3480; NMP/CMNH 1131), adult male, 10 Jun 1992; and CMNH 649 (NMP 3481; NMP/CMNH 1132), old adult male, 11 Jun 1993. Twelve specimens are fluid preserved, with no skeletal material extracted to date. These are CMNH 642 (NMP/CMNH 1069), a scrotal male collected 28 May 1992, and CMNH 643 (NMP 3479; NMP/CMNH 1100), an adult female collected 1 Jun 1992, from the Dulangan River Valley (Philippines: Mindoro Isl., Mindoro Oriental Province; Municipality of San Teodoro;

Table 2.—Standard external measurements of the holotype of *Apomys gracilirostris*, CMNH 650, and univariate statistics of male and female specimens of *A. gracilirostris*. There were no significant differences between males and females ($P = 0.05$), however, males displayed non-normally distributed measurements in total length ($P = 0.0039$) and mass ($P = 0.0005$). Sample size is four females and 13 males (including holotype) for all measurements except mass, twelve males. All measurements expressed in millimeters except mass, in grams.

Character	Holotype (CMNH 650)	Females		Males	
		Mean ± *SD*	Range	Mean ± *SD*	Range
Total length	294	306.2 ± 23.21	283–330	314.1 ± 30.98	288–398
Tail length	157	161.2 ± 12.61	147–175	159.0 ± 14.50	135–185
Length of hind foot	39	36.5 ± 3.70	33–41	38.8 ± 3.05	34–45
Length of ear	21	19.2 ± 1.26	18–21	18.6 ± 2.72	14–22
Mass	80	88.8 ± 17.97	75–115	87.4 ± 18.28	71–140

North approach to Mt. Halcon, Dulangan River Valley, ca. 1255 m, approx. 13°17′27″N, 121°59′32″W); CMNH 644 (NMP/CMNH 1108), a scrotal male collected 4 Jun 1992, and CMNH 645 (NMP/CMNH 1118), also a scrotal male, collected 7 Jun 1992 from the same locality as the holotype. Seven specimens, CMNH 634, 637 and 639–641 (inclusive), all males, and 635 and 636, females, are from an elevation of ca. 1900 m, an area known to the Mangyan tribespeople as Patok-tok, just above the type locality. All paratypes are in excellent condition except as noted. The following specimens will be permanently housed at the National Museum of the Philippines: CMNH 634 (NMP 3475), 635 (3476), 637 (3477), 641 (3478), 643 (3479), 648 (3480), 649 (3481), and the holotype, CMNH 650, NMP 3482.

Diagnosis.—*Apomys gracilirostris* is distinguished from its congeners by the following combination of traits: with respect to remaining *Apomys,* upper incisors are asulcate and extremely compressed and thin, breadth of incisor tips averaging only 1.56 ± 0.053, versus extremes in the remaining large bodied *Apomys* of 1.66 ± 0.158 (*A .i. insignis* males from Davao Province) to 2.23 ± 0.178 (*A. datae* males); lower incisors unpigmented and elongate. Lower edge of incisive alveolus beginning (in the vertical plane) just in front of m1, whereas the body of the ramus between the first molar and incisor in other species of *Apomys* is much longer. The small width of the incisors becomes even more apparent as a ratio against occipitonasal length; in *A. gracilirostris* this is 0.039 ± 0.002, versus extremes in remaining large bodied *Apomys* of 0.050 (*A. abrae* females from Mountain Province) to 0.061 (a single *A. insignis bardus* female). The skull is gracile, with a long rostrum. The combination of large body (combined head and body length, 143.6 ± 3.97; range 137–147), very long tail (length, 168.2 ± 9.47; range 157–179), dark pelage, gracile cranium, long rostrum (length, 14.11 ± 0.425; range 13.86–14.86), compressed and thin upper incisors (breadth at incisor tips, 1.56 ± 0.054; range, 1.51–1.62) and elongate, unpigmented lower incisors are sufficient to diagnose the species.

Description.—All specimens adults, pelage dark brown on dried skins (Fig. 2), body relatively large for an *Apomys* (external measurements in Table 2), with a long, slender snout, and long tail and feet. Holotype and paratypes similar in dorsal and lateral coloration. Fur silky and soft; proximal part of dorsal hairs light grey, turning pale brown distally; with numerous black guard hairs. Overall color dark brown, although freshly captured specimens with a dark blue/green sheen; some specimens darker along mid-dorsal region. Color somewhat paler laterally. Ventral color variable. One specimen (646; Fig. 2) not differing between dorsal and ventral appearance with respect to tone; 647 and 646 are marginally paler, 647 with silver-tipped grey hairs, 648 with grey hairs tipped with pale brown; 649 and 650 buffy ventrally, (particularly the former; see Fig. 2) with grey hairs tipped to a greater (649) or lesser (650) extent with brown.

Tail generally uniformally dark, however, sometimes paler on ventral surface, some individuals displaying a white extremity, varying from 2 mm in length (637) to 6 mm (640) or 10 mm (639). Scale row counts 14/cm at both base and midsection of tail.

Mystacial vibrissae present; anteriormost ones dark grey, dorsad and caudad ones black, with some fading to grey distally. Ears small relative to size of head; dark brown on inner surface, slightly paler on outer surface.

Hindfeet relatively long (females: mean, 36.5 mm, *SE* 3.70, range, 33–41; males, 38.8 *SE* 3.05, range 34–45), and dark dorsally. Plantar surface also dark, with paler tubercules forming a contrast. Claws relatively long; foreclaws ca. 3 mm in length; hindfoot claws ca. 4 mm long.

Vertebral counts identical except for number of caudal vertebrae: atlas, axis, 5 innominate cervical, 13 thoracic, six abdominal, and three pelvic vertebrae (craniad weakly fused to two, strongly fused caudad vertebrae). Specimen 648 with 32 caudal vertebrae, while 646 and 647 with 35.

Premaxillae projecting approximately 2.5 mm beyond anterior edge of incisive alveoli; top of nasals projecting marginally beyond this. Nasals widest at their anterior extremities, curving somewhat downward to meet premaxillae; nasals narrowing somewhat caudally, narrowest at fronto-nasal suture. Nasals and lower surfaces of premaxillae, maxillae, and palatine almost on same plane, with little tapering towards rostrum when viewed laterally. Incisive foramina long and narrow (4.9 ± 0.102), typically end about 1.3 mm anterior to first molar.

Zygomatic arches and zygomatic plates slender and delicate. As with other members of genus, edges of interorbital and postorbital areas rounded, without the beading characteristic of *Rattus*. Braincase smooth and round, the only protuberances those associated with occipital bone. Caudalmost end of cranium formed by an external occipital protuberance at caudalmost end of interparietal that meets squamous part of occipital (or supraoccipital bone), causing occipital bone to project beyond occipital condyles. Paired protuberances present where caudal ends of squamosal bones meet supraoccipital; without lambdoidal ridge.

Mastoid somewhat inflated. Squamosomastoid foramen present, but not as well developed (as a fenestra) as in *A. insignis*, for example; present only on one side in the holotype (650), 648, and 649 (extremely reduced); on both sides 646 and 647. Large postglenoid fossa separating squamosal from periotic bones.

Foramina of alisphenoid region essentially as described for *Apomys* (Musser 1982), with slight modifications. Lateral strut of alisphenoid bone slender, much more so than illustrated for *A. insignis* (AMNH 207571) by Musser (1982). No separation between anterior opening of alisphenoid canal and coalesced masticatory-buccinator foramina, so that all three are consolidated. Masticatory nerve emerging from posterior end of this consolidated foramen, leaving deep furrow in alisphenoid bone, particularly in region proximal to its point of emergence. From a ventral perspective, auditory bulla separated from alisphenoid bone by middle lacerate foramen, which is only thinly separated from the postglenoid vacuity. Sphenopterygoid vacuity variable in conformation, being single (separating alisphenoid from pterygoid), or consisting of the same, with an additional opening at caudal edge of pterygoid. A varying number of sphenopalatine foramina of varying conformation present. Minute dorsal palatine foramen present in orbital region, above roots of M2. Sphenopalatine foramen, just anterior to dorsal palatine fo-

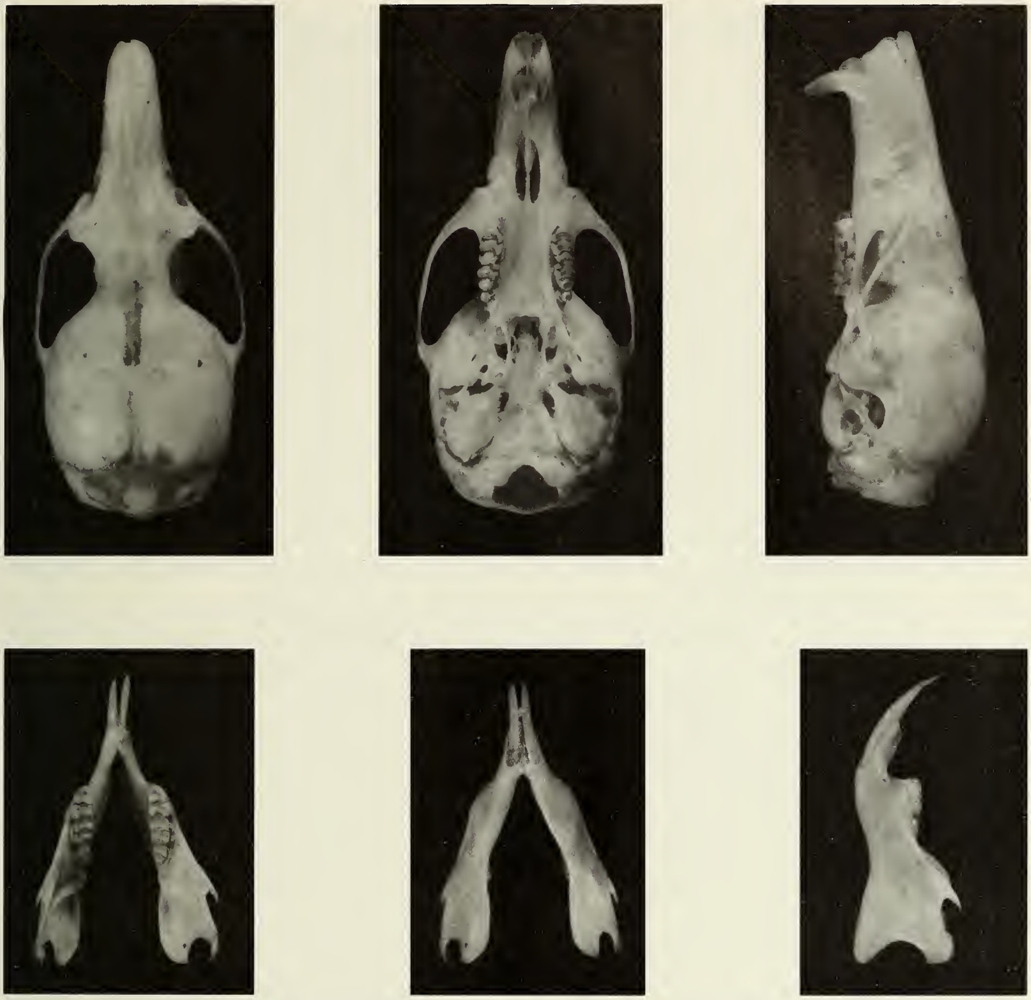

Fig. 3. Dorsal, ventral, and lateral views of cranium and mandibles of the holotype of *Apomys gracilirostris* (CMNH 650). Occipitonasal length 39.4 mm, zygomatic breadth, 17.6 mm, length of dentary, 20.3 mm.

ramen, likewise inconspicuous (in some cases closed); where present, only evident as a depression in maxilla. Sphenoid bone with relatively small optic canal separated by a strut from the much larger orbital fissure.

Dentaries (Fig. 3) with angular process projecting beyond plane of mandibular condyle. Lower edge of incisive alveolus beginning (in the vertical plane) just anterior to m1. With a large protuberance (capsular process sensu Musser & Heaney 1992) forming around end of root of lower incisor, on labial side of dentary, just anterior and ventral to coronoid process, forming narrow shelf that narrows posteriorly into mandibular condyle.

Upper incisors asulcate, extremely compressed and thin, their combined width averaging 1.56 ± 0.053. Enamel pale orange. Lower incisors extremely elongate and slender, also asulcate, and lacking pigment on their enamel surfaces.

Molars (Fig. 5) typical of *Apomys* (refer to fig. 15 in Musser 1982), with a few notable differences. All cusps occupying rela-

Fig. 4. Ventral view of pterygoid and mesopterygoid regions in the holotype of *Apomys gracilirostris*; bottom left is the bony eustachian tube, anterior is to the top.

tively greater area of crown than in other species of *Apomys*. Anterior labial cleft separating the hypothesized front two laminae of m1 not present; as a consequence, antero-lingual or antero-labial cusp not evident. Anterior lamina consisting simply of a large, crescent-moon-shaped ring of enamel surrounding a lacuna of dentine, presumably formed from fusion of anteroconid, protoconid, and metaconid.

All three laminae of M1 relatively broad as well, occupying entire occlusal surface. M1 with a small distinction still evident between cusps t3 and t1/t2, which are continuous. Cusps t8 and t9 occupying almost entire caudad half of M1. No evidence of a

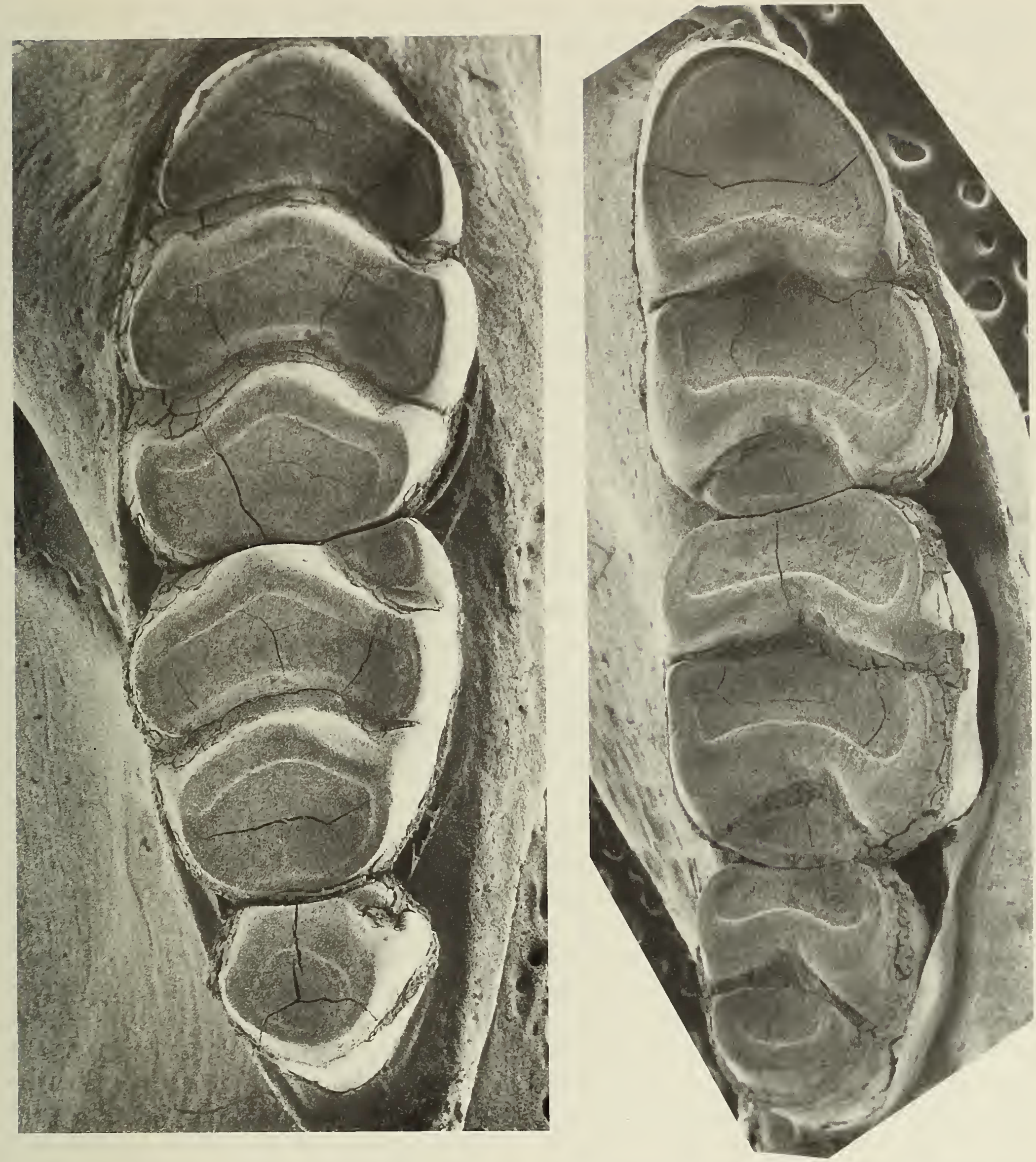

Fig. 5. Upper (left) and lower molar toothrow of the holotype of *Apomys gracilirostris*; length of upper molar toothrow, 6.3 mm, length of lower molar toothrow, 6.4 mm.

posterior cingulum. M2 lacking cusp t1 (vide *A. musculus*), and t3 reduced and tightly compressed between t5 and t6 (continuously fused with t4) and t9 of M1. Cusp t8 large, ovoid, and comprising entire caudad half of M2. M3 with only the slightest trace of t3 existing (more obviously present in other *Apomys*), making this essentially a unicuspid molar. Specimen 649 differs from the other *A. gracilirostris* specimens in having only two upper molars in right maxilla (full complement in left) and two molars in right dentary (full complement in the left).

One female (CMNH 646) had 3 embryos, measuring 2 mm crown–rump length; two of these were on the right horn of the uterus;

636 displayed a swollen uterus with no placental scars. Two of five males from the area surrounding 1900 m were scrotal; males from lower elevations (646–650) all displayed scrotal testes. Testes measurements were 6 × 4 mm (647 and 648) and 7 × 4 mm (649); no measurements were obtained on testes of 650.

Distribution.—*Apomys gracilirostris* is known only from the type locality and general vicinity, with an elevational range of ca. 1250–1950 m; it may occur throughout the highlands of Mindoro, particularly northern Mindoro, where there still remain large tracts of relatively undisturbed montane and midmontane forests.

Etymology.—gracilis + rostrum—a combination of the latin words describing the particularly long and slender rostrum of this species of *Apomys* (with respect to other *Apomys,* and most rodents).

Ecology.—Starting at ca. 1250 m on the north slope of Mount Halcon, the canopy height of the forest (in the general category of Montane Forest) averaged 14–16 m in sheltered areas, with some emergents to 20 m; more exposed areas displayed a canopy height of 6–8 m with emergents to 11 or 12 m. The canopy generally was uneven, allowing considerable light to penetrate in places, although the forest immediately adjacent to the Dulangan River had a very dense canopy. All areas had heavy undergrowth up to 2 m high. Tree ferns *(Cyathea),* birds' nest fern *(Asplenium),* climbing bamboo, palms, and pandans (particularly *Pandanus*) were very common. Also indicative of the extremely wet nature of the area was the heavy growth of moss on trees.

The most dominant trees (typically composing at least 25% of plot surveys) were *Tristania* sp. (Myrtaceae), *Lithocarpus* sp. (Fagaceae) and *Leptospermum flavescens* (Myrtaceae). Important trees (constituting 5–15% of plot surveys) were *Decaspermum paniculatum* and *Tristaniopsis* sp. (Myrtaceae), *Praravinia* sp. and *Psychotria* sp. (Rubiaceae), *Ficus* sp. (Moraceae), *Pinanga* sp. (Arecaceae), *Elaeocarpus* sp. (Elaeocarpaceae) and *Adinandra* sp. (Theaceae). Primary understory trees were *Saurauia* sp. (Actinidiaceae), *Syzygium* sp. (Myrtaceae), *Astronia* sp. (Melastomataceae), and *Symplocos* sp. (Symplocaceae). Numerous herbs and shrubs also abounded. Forest composition in this general area of Mount Halcon also was detailed by Ames (1907), Brotherus (1907), and Merrill (1907b).

From 1600 m to 1950 m, numerous areas were overgrown with bamboo, with the only tree species present being *Agathis philippinensis* ("almaciga"). In areas of closed forest, canopy heights ranged from 7–10 m in most areas, with the tallest trees (in sheltered areas) growing up to ca. 20 m. The canopy was considerably more closed (up to 80% closed) at this elevation that at the lower elevations. Pandans and gingers were so common in some areas as to make passage quite difficult. Leaf litter was approximately 6–8 cm thick. Numerous epiphytic ferns and orchids were present, although none occurred on the almaciga trees.

The gracile skull, long rostrum, reduction in relative size of upper incisors, and extreme elongation of lower incisors of *A. gracilirostris* all point to a diet of soft-bodied invertebrates, although additional, freshly sacrificed specimens will need to be examined to confirm this hypothesis (stomach contents were not readily recognizable). The long tail, and relatively long hind feet with well-developed claws point to a scansorial lifestyle. Much more ecological data, perhaps from mark and recapture studies, still need to be gathered on this little known species.

Comparisons.—The most conspicuous feature of the cranium in *A. gracilirostris* (Fig. 3) is the long and slender rostrum; the length in the five crania examined was 14.11 ± 0.425 (range: 13.86–14.86). Only *A. datae* males exceed *A. gracilirostris* in this respect; for 10 females examined, 13.42 ± 0.702 (12.5–15.0); 7 males, 14.14 ± 0.480 (13.30–14.78); means in other species ranged to a low of 10.45 ± 0.292 for male *A. insignis* from Davao Province. The ratio of rostrum length to skull length is surpassed only by male *A. datae* and female *A. abrae* from Mountain Province, Luzon; for *A. gracilirostris*, 0.354 ± 0.005 (0.348–0.360), versus extremes of 0.329 (female *A. insignis* from Mount Kitanglad, Bukidnon Province, Mindanao) to 0.356 (for 7 male *A. datae* from Davao City Province, Mindanao Island); *A. abrae* females from Mountain Province displayed a mean of 0.355 ± 0.021.

The interorbital region, averaging 6.0 ± 0.233 mm, is relatively the narrowest among *Apomys* species: the ratio of interorbital width to occipitonasal length is 0.150, versus extremes in other *Apomys* of 0.151 (female *A. abrae* from Ilocos Norte, Luzon) to 0.167 (female *A. insignis* from Mt. McKinley, Davao, Mindanao Isl. [this locality may currently be more easy to locate as Mt. Talomo, within the boundary of Davao City Province]).

The conformation of the carotid arterial patterns in *A. gracilirostris* clearly unite this new species in a group with *A. datae* and *A. sacobianus*. The presence of a stapedial foramen in the auditory bulla, together with a relatively large carotid canal for the internal carotid artery, and a prominent furrow between the middle lacerate foramen and the foramen ovale (Fig. 4) for the internal maxillary artery, also is a trait shared by *A. gracilirostris*, *A. datae* and *A. sacobianus*. It should be noted, however, that this pattern is hypothesized to constitute the ancestral arterial pattern among muroid rodents (Hill 1935, Musser 1982, Musser & Heaney 1992), and as such should not be interpreted as expressing phylogenetic affinity between these *Apomys* species. The minute dorsal palatine foramen present in orbital region, above roots of M2, distinguishes the new species from *A. insignis*, which has an easily visible foramen above the junction between M1 and M2. A more explicit statement of hypothesized relationships among these three species *Apomys*, and among all the members of the genus, will have to await results of an upcoming revision.

The dentaries (Fig. 3) display distinct differences between *A. gracilirostris* and other *Apomys* having to do with the relative length of the angular process and mandibular condyle. When viewed from the side, most *Apomys* (e.g., *A. datae*, *A. insignis*, and *A. musculus*, as illustrated in fig. 8 of Musser 1982: 24) display a mandibular condyle that projects somewhat beyond the vertical plane of the angular process. In contrast, in *A. gracilirostris*, it is the angular process that projects beyond the plane of the mandibular condyle. Another characteristic distinguishing this species from all other *Apomys* is that the lower edge of the incisive alveolus begins (in the vertical plane) just in front of m1, whereas the body of the ramus between the first molar and incisor in other species of *Apomys* is much longer. A large protuberance (capsular process sensu Musser & Heaney 1992) forms around the end of the root of the lower incisor, on the labial side of the dentary, just anterior and ventral to the coronoid process, forming a narrow shelf that fades back into the mandibular condyle.

The teeth of *A. gracilirostris* are the most diagnostic feature separating the species from its congeners: in fact, the upper and lower incisors are sufficient to diagnose the species, in a museum or in the field. Among *Apomys*, *A. gracilirostris* likewise displays an increasing degree of molar reduction and simplification of crowns, epitomized by the reduction in number of molars found in *A. gracilirostris* specimen 649. In fact, upon first examination, the extreme reduction of the molars together with the lack of a pigmented enamel on the lower incisors, led me to believe that *A. gracilirostris* constituted a new genus, which it still may, once stricter and more careful analyses are carried out of *Apomys* and potential sister taxa. Outgroup taxa that must be included in such an analysis are the native Philippine shrew rats (*Crunomys, Chrotomys,* and *Rhyncomys).* Inclusion of these taxa will enable testing one of the three hypotheses of generic relationships of *Apomys* proposed by Musser & Heaney (1992): that *Apomys* may be more related to the native Philippine shrew rats than to other Philippine endemics or genera from other archipelagos. The somewhat inflated mastoid bone of *A. gracilirostris* is reminiscent of a condition noted in *Tarsomys apoensis* (Musser & Heaney 1992). It was impossible to determine the homology between the principal cusp comprising the almost unicuspid M3 in *Apomys* and the same structure in other Murinae; Musser and Heaney (1992) hypothesized that the *Apomys* M3 cusp may be homologous with t5 of other murines.

The intent of this work was not to assess the specific status of the two nominal taxa currently included in *A. insignis, A. i. insignis* and *A. i. bardus.* However, it is clear that the lack of morphological differences between these two taxa lends support to the hypothesis that they clearly do not constitute separate species (Musser 1982), and probably not even separate subspecies.

Discussion

Finding a new species of *Apomys* in the Philippines is not as surprising as the fact that it was found in an area that already had been explored by naturalists. Edgar A. Mearns spent some time in the general area, but further east than the new species was collected (Merrill 1907a). This highlights the fact that as good as the turn of the century collectors were, there still are areas in the Philippines that need more thorough study in order to arrive at a fuller understanding of their existing biodiversity. It is even more critical today than before to document the biodiversity in the Philippines, as continuing loss of forest cover leaves ever diminishing pristine habitats available for wildlife. We observed some limited scale logging (with chain-saws and water buffalo) going on up to an elevation of 950 m in the Mount Halcon area, in spite of the fact that the entire area is purportedly protected from exploitation by all save the native Mangyan tribal peoples. These forests harbor a rich endemic fauna, including *Apomys gracilirostris,* the rare endemic *Anonymomys mindorensis* (pers. obv., Musser 1981), very high population levels of *Chrotomys mindorensis* (pers. obv., Musser et al. 1982), and other, as yet undescribed species. The ineluctable conclusion with respect to the conservation of the Mount Halcon Highlands is that the remaining areas of forest must at all costs be protected.

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Appendix 1.—Means (plus or minus one standard deviation; sample size in parentheses) and ranges for 28 cranial and mandibular measurements in 12 populations of *Apomys* examined. Superscript 'a' indicates holotype of *A. gracilirostris.*

Taxon: Character	*A. abrae* (♀) (Abra Prov.)	*A. abrae* (♀) (Ilocos Norte Prov.)		*A. abrae* (♂) (Ilocos Norte Prov.)		*A. abrae* (♀) (Mountain Prov.)	
BB	—	14.71 ± 0.52 (3)	14.2–15.2	13.79 ± 0.60 (3)	13.1–14.3	14.86 ± 0.18 (2)	14.7–15.0
BIF	—	2.08 ± 0.09 (7)	2.0–2.2	2.12 ± 0.05 (3)	2.1–2.2	1.89 ± 0.17 (2)	1.8–2.0
BIT	—	1.81 ± 1.34 (7)	1.7–2.1	1.80 ± 0.16 (3)	1.6–1.9	1.74 ± 0.08 (2)	1.7–1.8
BM1	1.9	3.20 ± 0.27 (7)	2.9–3.6	2.70 ± 0.36 (3)	2.3–2.9	3.28 ± 0.08 (2)	3.2–3.3
BM3	—	4.23 ± 0.24 (7)	3.8–4.5	3.98 ± 0.25 (3)	3.7–4.2	4.25 ± 0.10 (2)	4.2–4.3
BMF	—	2.27 ± 0.22 (7)	2.0–2.6	2.74 ± 0.50 (2)	2.4–3.1	2.38 ± 0.20 (2)	2.2–2.5
BR	—	5.93 ± 0.23 (7)	5.5–6.2	5.61 ± 0.21 (3)	5.4–5.8	6.32 ± 0.05 (2)	6.3–6.4
BZP	3.1	2.84 ± 0.16 (7)	2.6–3.0	2.75 ± 0.07 (3)	2.7–2.8	2.67 ± 0.03 (2)	2.6–2.7
HB	4.5	4.61 ± 0.37 (3)	4.2–4.9	4.30 ± 0.02 (2)	—	4.47 ± 0.31 (2)	4.2–4.7
HBC	—	10.60 ± 0.14 (3)	10.4–10.7	10.21 ± 0.71 (4)	9.7–11.3	10.70 ± 0.22 (2)	10.5–10.8
IB	—	5.42 ± 0.16 (7)	5.2–5.7	5.30 ± 0.13 (3)	5.2–5.4	5.40 ± 0.05 (2)	—
IFM1	1.8	1.69 ± 0.16 (7)	1.5–1.9	1.49 ± 0.23 (3)	1.2–1.7	1.62 ± 0.25 (2)	1.4–1.8
LB	5.0	4.96 ± 0.26 (2)	4.8–5.1	4.75 ± 0.11 (2)	4.7–4.8	4.48 ± 0.11 (2)	4.4–4.6
LD	8.8	8.54 ± 0.30 (7)	8.0–8.9	8.66 ± 0.60 (3)	8.0–9.2	8.06 ± 0.52 (2)	7.7–8.4
LIF	4.5	4.73 ± 0.15 (7)	4.6–4.9	4.93 ± 0.23 (3)	4.7–5.1	4.61 ± 0.40 (2)	4.3–4.9
LM13	6.5	6.64 ± 0.24 (7)	6.4–7.0	6.86 ± 0.55 (4)	6.1–7.4	7.00 ± 0.05 (2)	—
LN	13.3	13.05 ± 0.55 (7)	12.3–13.6	13.39 ± 0.54 (3)	12.8–13.8	12.96 ± 1.06 (2)	12.2–13.7
LPB	8.4	7.96 ± 0.08 (7)	7.8–8.1	7.46 ± 0.02 (2)	7.4–7.5	7.40 ± 0.15 (2)	7.3–7.5
LR	11.9	11.96 ± 0.39 (7)	11.4–12.5	11.82 ± 0.63 (3)	11.2–12.5	12.54 ± 1.24 (2)	11.7–13.4
ONL	35.1	35.36 ± 0.95 (4)	34.3–36.3	34.98 ± 1.00 (3)	33.9–35.9	35.24 ± 1.42 (2)	34.2–36.2
PL	18.0	17.52 ± 0.29 (7)	17.1–17.9	16.64 ± 0.51 (3)	16.2–17.2	17.30 ± 1.02 (2)	16.6–18.0
PPL	9.8	10.76 ± 0.60 (3)	10.1–11.3	11.51 ± 1.82 (3)	10.0–13.5	10.70 ± 0.40 (2)	10.4–11.0
ZB	—	17.0 — (1)	—	—	—	—	—
LMAND	19.8	19.16 ± 0.23 (6)	18.9–19.5	19.20 ± 1.21 (4)	17.7–20.5	19.08 ± 1.15 (2)	18.2–19.9
LMT	6.4	6.42 ± 0.36 (7)	6.0–6.9	6.29 ± 0.42 (4)	5.7–6.6	6.46 ± 0.63 (2)	6.0–6.9
HMC	7.4	8.06 ± 0.35 (7)	7.7–8.6	7.80 ± 0.62 (4)	7.0–8.4	7.78 ± 0.25 (2)	7.6–8.0
HMR	2.8	2.65 ± 0.11 (7)	2.5–2.8	2.70 ± 0.10 (4)	2.6–2.8	2.68 ± 0.08 (2)	2.6–2.7
TM	1.8	2.08 ± 0.09 (7)	2.0–2.3	1.96 ± 0.17 (4)	1.8–2.1	1.81 ± 0.11 (2)	1.7–1.9

Taxon: Character	*A. abrae* (♂) (Mountain Province)		*A. datae* (♀) (Mountain Province)		*A. datae* (♂) (Mountain Province)	
BB	14.95 ± 0.55 (7)	13.9–15.6	15.28 ± 0.43 (10)	14.8–16.0	15.46 ± 0.42 (7)	14.7–15.9
BIF	1.98 ± 0.21 (7)	1.8–2.3	2.22 ± 0.15 (10)	2.0–2.5	2.49 ± 0.15 (7)	2.4–2.8
BIT	1.81 ± 0.08 (7)	1.7–1.9	2.02 ± 0.12 (10)	1.8–2.2	2.23 ± 0.18 (6)	2.1–2.6
BM1	3.18 ± 0.14 (7)	3.0–3.4	3.17 ± 0.21 (10)	2.7–3.5	3.40 ± 0.10 (7)	3.2–3.6
BM3	4.12 ± 0.34 (7)	3.4–4.4	4.65 ± 0.27 (10)	4.4–5.1	4.81 ± 0.19 (7)	4.6–5.1
BMF	2.38 ± 0.21 (7)	2.2–2.7	2.39 ± 0.28 (10)	1.8–2.9	2.58 ± 0.17 (6)	2.4–2.8
BR	5.99 ± 0.15 (7)	5.8–6.2	6.59 ± 0.30 (10)	6.3–7.3	6.92 ± 0.35 (7)	6.4–7.4
BZP	2.98 ± 0.21 (7)	2.7–3.3	3.30 ± 0.22 (10)	2.9–3.6	3.45 ± 0.18 (7)	3.2–3.6
HB	4.37 ± 0.33 (7)	3.9–4.7	4.73 ± 0.33 (10)	4.2–5.2	4.79 ± 0.24 (7)	4.5–5.1
HBC	10.41 ± 0.35 (7)	9.7–10.7	11.15 ± 0.41 (10)	10.6–12.0	11.21 ± 0.52 (7)	10.4–11.8
IB	5.65 ± 0.14 (7)	5.4–5.8	5.97 ± 0.13 (10)	5.8–6.2	6.01 ± 0.27 (7)	5.5–6.4
IFM1	1.68 ± 0.10 (7)	1.5–1.8	2.02 ± 0.18 (10)	1.6–2.2	2.14 ± 0.16 (7)	2.0–2.4
LB	4.45 ± 0.19 (7)	4.2–4.6	4.70 ± 0.15 (10)	4.4–5.0	4.76 ± 0.20 (7)	4.4–5.1
LD	8.46 ± 0.51 (7)	7.8–9.4	9.24 ± 0.39 (10)	8.7–10.0	9.72 ± 0.29 (7)	9.4–10.1
LIF	4.68 ± 0.29 (7)	4.2–5.0	4.73 ± 0.41 (10)	3.9–5.2	4.83 ± 0.29 (7)	4.4–5.4
LM13	6.85 ± 0.16 (7)	6.6–7.0	6.92 ± 0.20 (10)	6.7–7.3	7.16 ± 0.15 (7)	7.0–7.4
LN	13.49 ± 0.37 (7)	13.0–14.0	14.66 ± 0.68 (10)	13.6–16.0	15.15 ± 0.67 (7)	14.3–16.3
LPB	8.22 ± 0.41 (7)	7.6–8.8	9.09 ± 0.28 (10)	8.6–9.5	9.38 ± 0.14 (7)	9.1–9.5
LR	12.54 ± 0.44 (7)	11.9–13.0	13.42 ± 0.70 (10)	12.5–15.0	14.14 ± 0.48 (7)	13.3–14.8
ONL	35.62 ± 0.80 (7)	34.4–37.1	38.48 ± 1.04 (10)	36.8–40.5	39.76 ± 0.60 (7)	38.6–40.3

Appendix 1.—Continued.

Taxon: Character	*A. abrae* (♂) (Mountain Province)		*A. datae* (♀) (Mountain Province)		*A. datae* (♂) (Mountain Province)	
PL	17.82 ± 0.66 (7)	17.0–19.1	19.11 ± 0.60 (10)	18.3–20.5	19.91 ± 0.42 (7)	19.4–20.8
PPL	10.36 ± 0.45 (7)	9.8–11.1	11.61 ± 0.46 (10)	10.9–12.2	11.87 ± 0.43 (7)	11.3–12.3
ZB	16.0 — (1)	—	18.03 ± 0.59 (5)	17.1–18.7	18.24 ± 0.26 (4)	18.1–18.6
LMAND	19.20 ± 0.46 (7)	18.3–19.8	20.95 ± 0.59 (10)	20.1–22.0	21.83 ± 0.57 (7)	21.0–22.5
LMT	6.24 ± 0.15 (7)	6.0–6.4	6.42 ± 0.23 (10)	6.1–6.8	6.69 ± 0.13 (7)	6.5–6.9
HMC	7.96 ± 0.18 (7)	7.7–8.3	9.13 ± 0.52 (10)	8.3–9.9	9.49 ± 0.31 (7)	9.1–10.0
HMR	2.67 ± 0.11 (7)	2.5–2.9	3.06 ± 0.14 (10)	2.8–3.3	3.26 ± 0.13 (7)	3.1–3.4
TM	1.85 ± 0.10 (7)	1.7–2.0	2.23 ± 0.08 (10)	2.1–2.3	2.23 ± 0.15 (7)	2.0–2.4

Taxon: Character	*A. i. insignis* (♀) (Bukidnon Province)		*A. i. insignis* (♂) (Bukidnon Province)		*A. insignis bardus* (♀) (Zamboanga del Norte Prov.)	
BB	13.32 ± 0.41 (6)	12.8–13.9	13.48 ± 0.30 (10)	13.0–14.1	13.63 — (1)	—
BIF	1.98 ± 0.22 (6)	1.6–2.3	2.02 ± 0.17 (11)	1.8–2.3	2.20 — (1)	—
BIT	1.69 ± 0.07 (6)	1.6–1.8	1.67 ± 0.10 (11)	1.5–1.8	1.82 ± 0.20 (2)	1.7–2.0
BM1	3.09 ± 0.30 (6)	2.7–3.4	3.06 ± 0.17 (11)	2.8–3.3	3.29 ± 0.04 (2)	—
BM3	4.28 ± 0.10 (6)	4.2–4.5	4.19 ± 0.15 (11)	3.9–4.4	4.23 ± 0.21 (2)	4.1–4.4
BMF	2.38 ± 0.16 (2)	2.3–2.5	2.28 ± 0.15 (8)	2.1–2.5	2.46 ± 0.02 (2)	2.4–2.5
BR	5.43 ± 0.16 (6)	5.3–5.7	5.37 ± 0.26 (10)	5.0–5.9	5.77 — (1)	—
BZP	2.48 ± 0.09 (6)	2.4–2.6	2.41 ± 0.19 (11)	2.1–2.7	2.20 ± 0.29 (2)	2.0–2.4
HB	3.80 ± 0.24 (6)	3.5–4.1	3.58 ± 0.54 (9)	2.7–4.2	3.76 ± 0.02 (2)	3.7–3.8
HBC	9.56 ± 0.13 (6)	9.4–9.8	9.39 ± 0.33 (9)	9.0–9.9	9.74 ± 0.07 (2)	9.7–9.8
IB	4.94 ± 0.16 (6)	4.7–5.2	5.07 ± 0.24 (11)	4.7–5.4	4.84 ± 0.37 (2)	4.6–5.1
IFM1	1.72 ± 0.25 (6)	1.4–2.1	1.65 ± 0.23 (11)	1.3–2.0	1.41 — (1)	—
LB	3.99 ± 0.19 (6)	3.8–4.3	3.78 ± 0.30 (10)	3.2–4.2	3.76 ± 0.00 (2)	—
LD	7.28 ± 0.36 (6)	6.7–7.7	7.31 ± 0.25 (11)	6.8–7.8	7.34 ± 0.16 (2)	7.2–7.4
LIF	3.68 ± 0.49 (6)	3.0–4.3	3.71 ± 0.21 (11)	3.3–4.0	3.78 — (1)	—
LM13	6.02 ± 0.10 (6)	5.8–6.3	5.86 ± 0.16 (11)	5.6–6.2	5.74 ± 0.30 (2)	5.5–6.0
LN	11.49 ± 0.39 (6)	11.0–12.0	11.64 ± 0.70 (11)	10.6–12.9	11.41 — (1)	—
LPB	7.41 ± 0.28 (2)	7.2–7.6	7.18 ± 0.02 (2)	—	7.02 — (1)	—
LR	10.48 ± 0.52 (6)	9.9–11.4	10.51 ± 0.58 (11)	9.3–11.5	10.72 — (1)	—
ONL	31.86 ± 0.60 (6)	31.2–32.9	31.68 ± 0.63 (10)	30.7–32.7	32.29 — (1)	—
PL	15.75 ± 0.44 (2)	15.4–16.1	15.41 ± 0.20 (2)	15.3–15.6	15.49 ± 0.25 (2)	15.3–15.7
PPL	9.71 — (1)	—	9.3 — (1)	—	9.13 ± 0.54 (2)	8.8–9.5
ZB	— — (0)	—	— — (0)	—	14.70 — (1)	—
LMAND	17.26 ± 0.21 (6)	17.0–17.6	17.06 ± 0.44 (10)	16.1–17.6	16.54 ± 0.35 (2)	16.3–16.8
LMT	5.38 ± 0.30 (6)	5.0–5.9	5.43 ± 0.17 (11)	5.2–5.7	5.24 ± 0.16 (2)	5.1–5.4
HMC	7.25 ± 0.24 (6)	6.9–7.5	7.29 ± 0.29 (11)	6.8–7.7	6.71 ± 0.16 (2)	6.6–6.8
HMR	2.46 ± 0.14 (6)	2.2–2.6	2.42 ± 0.13 (11)	2.1–2.7	2.45 ± 0.40 (2)	2.2–2.7
TM	1.78 ± 0.10 (6)	1.6–1.9	1.75 ± 0.13 (11)	1.5–1.9	1.65 ± 0.06 (2)	1.6–1.7

Taxon: Character	*A. insignis bardus* (♂) (Zamboanga del Norte Prov.)		*A. gracilirostris*					
			1136[a] (♂)	1126 (♂)	1131 (♂)	1132 (♂)	1119 (♀)	Means (±SD)
BB	13.29 — (1)	—	15.6	16.1	15.3	15.6	15.6	16.05 ± 0.471
BIF	1.94 ± 0.06 (2)	1.9–2.0	1.8	2.0	2.1	2.1	1.9	1.98 ± 0.145
BIT	1.83 ± 0.03 (3)	1.8–1.9	1.6	1.5	1.6	1.5	1.5	1.56 ± 0.054
BM1	3.01 ± 0.07 (2)	3.0–3.1	3.5	3.5	4.4	4.3	4.5	4.05 ± 0.486
BM3	4.32 ± 0.09 (2)	4.2–4.4	4.7	5.0	5.5	—	5.7	5.24 ± 0.465
BMF	2.63 ± 0.21 (2)	2.5–2.8	1.9	2.1	2.0	2.2	2.3	2.09 ± 0.176
BR	5.72 ± 0.28 (2)	5.5–5.9	6.6	6.3	6.7	6.6	6.4	6.53 ± 0.145
BZP	2.36 ± 0.26 (2)	2.2–2.5	3.3	3.0	3.2	3.6	3.0	3.21 ± 0.223
HB	3.74 — (1)	—	4.2	4.0	3.4	4.2	3.8	3.92 ± 0.307
HBC	9.15 — (1)	—	11.1	11.3	10.5	10.4	11.1	10.88 ± 0.404
IB	4.91 ± 0.20 (2)	4.8–5.0	5.8	6.3	5.5	6.0	6.2	6.00 ± 0.233

Appendix 1.—Continued.

Taxon: Character	*A. insignis bardus* (♂) (Zamboanga del Norte Prov.)		*A. gracilirostris* 1136[a] (♂)	1126 (♂)	1131 (♂)	1132 (♂)	1119 (♀)	Means (±SD)
IFM1	1.82 ± 0.12 (2)	1.7–1.9	2.4	2.2	2.4	2.9	2.5	2.49 ± 0.241
LB	3.99 — (1)	—	5.1	5.0	4.8	5.2	5.0	5.03 ± 0.151
LD	7.62 ± 0.42 (2)	7.3–7.9	9.8	10.1	10.2	10.8	10.4	10.22 ± 0.450
LIF	3.80 ± 0.08 (6)	3.7–3.8	4.8	4.8	4.9	5.0	4.9	4.87 ± 0.102
LM13	5.54 ± 0.39 (3)	5.2–6.0	6.3	6.3	6.6	6.2	6.5	6.39 ± 0.246
LN	11.96 ± 0.46 (2)	11.6–12.3	14.8	14.8	14.5	16.0	14.9	15.00 ± 0.566
LPB	7.44 ± 0.15 (2)	7.3–7.6	9.2	8.8	9.1	9.5	9.0	9.14 ± 0.259
LR	10.70 ± 0.11 (2)	10.6–10.8	13.9	13.9	14.0	14.9	13.9	14.11 ± 0.425
ONL	32.06 — (1)	—	39.4	39.7	39.0	41.6	39.8	39.89 ± 0.997
PL	15.75 ± 0.07 (2)	15.7–15.8	19.1	19.0	19.4	19.9	19.4	19.35 ± 0.344
PPL	9.21 — (1)	—	11.9	11.6	11.6	12.3	12.1	11.92 ± 0.310
ZB	— — (0)	—	17.6	17.6	18.0	18.6	18.1	17.98 ± 0.389
LMAND	16.25 ± 1.13 (2)	15.4–17.0	20.3	19.5	20.2	21.5	20.8	20.47 ± 0.750
LMT	5.42 ± 0.11 (2)	5.4–5.5	6.4	6.2	6.2	6.6	6.2	6.32 ± 0.183
HMC	6.70 ± 0.40 (2)	6.4–7.0	8.5	8.6	8.2	9.0	8.9	8.64 ± 0.298
HMR	2.40 ± 0.20 (2)	2.2–2.5	2.9	2.8	2.9	3.0	2.8	2.88 ± 0.090
TM	1.56 ± 0.06 (2)	1.5–1.6	1.9	1.7	1.8	1.8	1.8	1.80 ± 0.062